MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
General Certificate of Education Ordinary Level

Paper 1 Multiple Choice

October/November 2012

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.

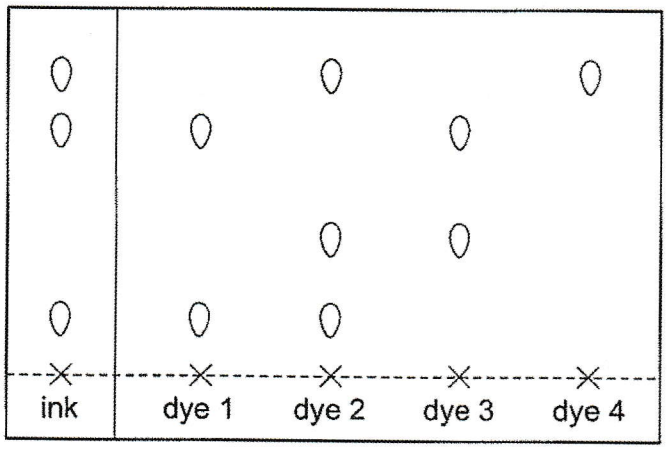
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

21 A coloured ink is compared with four different dyes.

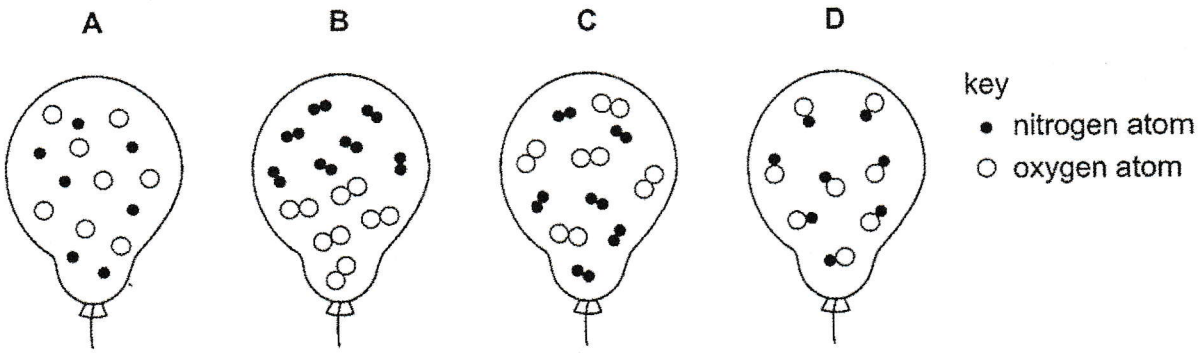
The chromatogram produced is shown in the diagram.



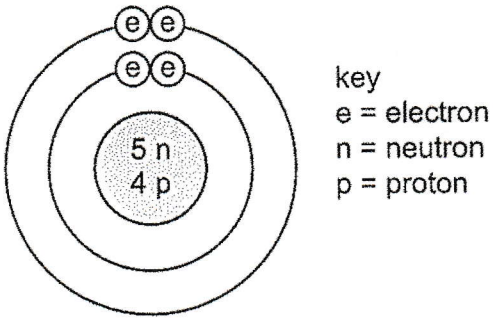
Which dyes does the ink contain?

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

22 Which diagram shows the arrangement of particles inside a balloon filled with a mixture of nitrogen and oxygen?



23 The diagram represents an atom of an element, X.



Which symbol represents this atom?

A $^{9}_{4}X$ **B** $^{9}_{5}X$ **C** $^{4}_{9}X$ **D** $^{5}_{9}X$

24 A metal X and a non-metal Y react together to form an ionic compound X_2Y_3.

Which row is correct?

	electrons given away by each atom of X	electrons received by each atom of Y
A	1	3
B	2	3
C	3	1
D	3	2

25 Which pair of elements form a compound by sharing electrons?

A carbon and chlorine

B lithium and iodine

C neon and oxygen

D potassium and bromine

26 Hydrogen sulfide burns in an excess of oxygen according to the following equation:

$$2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(g) + 2SO_2(g)$$

48 dm^3 of hydrogen sulfide is burned.

Which volume of sulfur dioxide will be formed at room temperature and pressure?

[All volumes are measured at the same temperature and pressure.]

A 24 dm^3 **B** 36 dm^3 **C** 48 dm^3 **D** 96 dm^3

27 25 cm^3 of aqueous 0.1 mol / dm^3 hydrochloric acid exactly neutralises 20 cm^3 of aqueous sodium hydroxide.

The equation for this reaction is

$$NaOH + HCl \rightarrow NaCl + H_2O$$

What is the concentration of the sodium hydroxide solution?

A 0.080 mol / dm^3

B 0.800 mol / dm^3

C 0.125 mol / dm^3

D 1.25 mol / dm^3

28 Which statements about endothermic reactions are correct?

1 Energy is released to the surroundings.

2 Energy is absorbed from the surroundings.

3 The temperature of the reactants rises.

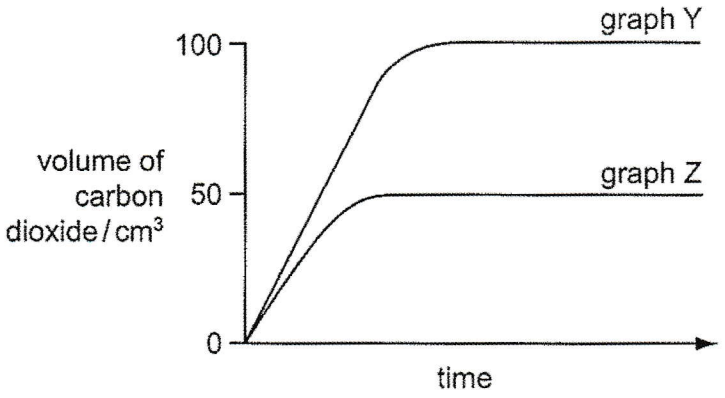
4 The temperature of the reactants falls.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

29 Some crystals of magnesium carbonate were added to an excess of sulfuric acid at room temperature.

The volume of carbon dioxide produced was measured over a period of time. The results are shown in graph Y.

The experiment was repeated and graph Z was obtained.



Which change was used to obtain the results shown in graph Z?

A Acid of the same volume and half the original concentration was used.

B Half the mass of magnesium carbonate was used.

C Larger crystals of magnesium carbonate were used.

D Using a lower temperature.

30 Substance X turns a solution of acidified potassium dichromate(VI) from orange to green.

What must solution X contain?

A an alkali

B an ammonium salt

C an oxidising agent

D a reducing agent

31 What is the ionic equation for the reaction between hydrochloric acid and sodium hydroxide?

A $H^+ + OH^- \rightarrow H_2O$

B $2H^+ + O^{2-} \rightarrow H_2O$

C $Na^+ + Cl^- \rightarrow NaCl$

D $H^+ + Cl^- \rightarrow HCl$

32 Which solid reacts with dilute sulfuric acid to produce a gas?

A carbon

B copper

C magnesium oxide

D sodium carbonate

33 The table shows some properties of four metals.

Which metal is in Group I of the Periodic Table?

	density	hardness
A	high	hard
B	high	soft
C	low	hard
D	low	soft

34 Experiments are carried out to arrange metals X, Y and Z in order of decreasing reactivity.

The table shows the results.

experiment	X	Y	Z
Does the metal react with dilute hydrochloric acid?	yes	no	yes
Is the oxide of the metal reduced by heating with carbon?	yes	yes	no

What is the order of reactivity of the metals?

	most reactive →		least reactive
A	X	Z	Y
B	Y	X	Z
C	Z	X	Y
D	Z	Y	X

35 Which pair of substances act as reducing agents in the blast furnace?

A carbon and carbon monoxide

B carbon and oxygen

C carbon dioxide and oxygen

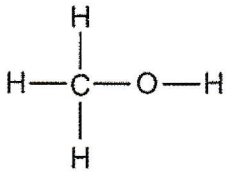
D carbon monoxide and carbon dioxide

36 Which air pollutant is **not** correctly matched to its source?

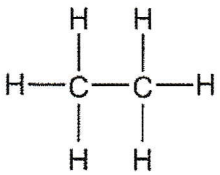
	air pollutant	source
A	carbon monoxide	complete combustion of fossil fuels
B	nitrogen oxides	lightning activity
C	sulfur dioxide	volcanoes
D	unburned hydrocarbons	incomplete combustion of fossil fuels

37 The diagrams show the structures of four organic molecules.

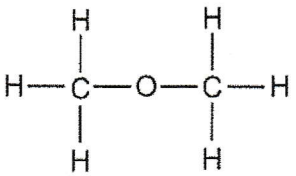
P



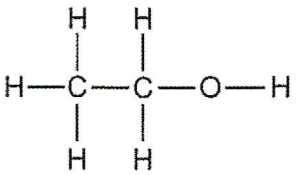
Q



R



S



Which two are members of the same homologous series?

A P and R **B** P and S **C** Q and R **D** R and S

38 What is methane the main constituent of?

A diesel

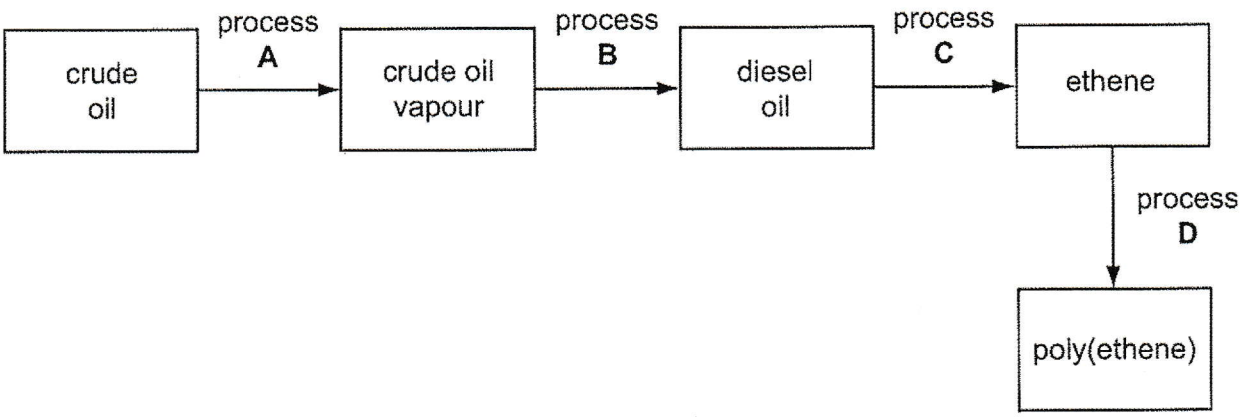
B naphtha

C natural gas

D petrol

39 The flow chart outlines the manufacture of poly(ethene) from crude oil.

Which process involves cracking?



40 When ethanol is left standing in the air for some time, it becomes acidic.

Which equation represents this change?

A $CH_3CH_2OH + CO \rightarrow CH_3CH_2CO_2H$

B $CH_3CH_2OH + O_2 \rightarrow CH_3CO_2H + H_2O$

C $CH_3CH_2OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

D $2CH_3CH_2OH + O_2 \rightarrow 2CH_3CO_2H + 2H_2$

21. (B)

By comparing the distances travelled by each component, we find that the components of dyes 1 and 4 travel the same distance as the components of the ink.

EXAM TIP:

Identical dyes travel the same distance in the same chromatogram.

22. (C)

Oxygen and nitrogen exist as diatomic gases. These molecules are constantly in motion and will be found evenly spread in the balloon.

EXAM TIP:

Nitrogen and oxygen are diatomic gases.

23. (A)

The atom has a proton number (or atomic number) of 4 and a nucleon number of 9. The proton number is shown at the bottom left of the chemical symbol while the nucleon number is on the top left.

EXAM TIP:

The proton number is shown on the bottom left of the chemical symbol while the nucleon number is on the top left.

24. (D)

Non-metal atoms receive electrons from metal atoms, forming anions and cations respectively. The metal atom forms X^{3+} and the non-metal atom forms Y^{2-}. Each atom of X gives away 3 electrons while each atom of Y accepts 2 electrons.

EXAM TIP:

The charge carried by each ion shows the number of electrons given away or received.

25. (A)

Non-metals form compounds by sharing electrons. Neon is a noble gas and will not form compounds.

EXAM TIP:

A compound which consists of non-metal atoms is formed by sharing electrons (covalent bond).

26. (C)

2 moles of hydrogen sulfide produce 2 moles of sulfur dioxide.

Since 1 mole of any gas occupies 24 dm^3 at room temperature and pressure, 48 dm^3 of hydrogen sulfide reacts to produce 48 dm^3 of sulfur dioxide.

EXAM TIP:

1 mole of any gas occupies 24 dm^3 at r.t.p.

27. (C)

Number of moles of hydrochloric acid

$= \frac{25}{1000} \times 0.1$

$= 0.0025$ mol

1 mole of hydrochloric acid reacts with 1 mole of sodium hydroxide.

Number of moles of sodium hydroxide = 0.0025 mol

Concentration of sodium hydroxide solution

$= 0.0025 \div \frac{20}{1000}$

$= 0.125$ mol / dm^3

EXAM TIP:

$\text{Concentration (mol / dm}^3\text{)} = \frac{\text{Number of moles of solute}}{\text{Volume (dm}^3\text{)}}$

28. (D)

EXAM TIP:

In an endothermic reaction, energy is absorbed from the surroundings and this is detected as a decrease in temperature of the surroundings.

29. (B)

In this reaction, sulfuric acid is in excess. Changes in the concentration of sulfuric acid used would not change the total volume of carbon dioxide produced. The total volume of carbon dioxide produced can only be halved by reducing the amount of magnesium carbonate used.

EXAM TIP:

The gradient of the graph reflects the rate of reaction while the height of the graph shows the maximum amount of products released.

30. (D)

Acidified potassium dichromate(VI) turns from orange to green when $Cr_2O_7^{2-}$ ions are reduced to Cr^{3+}. Since it is reduced, a reducing agent is present.

EXAM TIP:

A substance that causes another substance to be reduced is a reducing agent.

31. (A)

$HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

$H^+(aq) + \cancel{Cl^-(aq)} + \cancel{Na^+(aq)} + OH^-(aq) \rightarrow$

$\cancel{Na^+(aq)} + \cancel{Cl^-(aq)} + H_2O(l)$

Cancelling out the spectator ions:

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

This ionic equation applies to all neutralisation reactions between a hydroxide and an acid.

EXAM TIP:

The reaction between hydrochloric acid and sodium hydroxide is a neutralisation reaction. Neutralisation involves the reaction between H^+ and OH^- ions to produce water.

32. (D)

Sodium carbonate reacts with dilute sulfuric acid to produce carbon dioxide gas.

EXAM TIP:

Only metals above hydrogen in the reactivity series liberate hydrogen gas when reacted with dilute acid.

33. (D)

Group I metals have relatively low densities and are soft enough to be cut with a knife.

EXAM TIP:

Group I metals have relatively low densities and are soft.

34. (C)

Z lies above both hydrogen and carbon in the reactivity series since it reacts with dilute hydrochloric acid and is not reduced by carbon. X is the next most reactive as it lies above hydrogen but below carbon. Y is the least reactive as it lies below both hydrogen and carbon.

Therefore the order of reactivity is Z > X > Y.

EXAM TIP:

The most reactive metal out of the three metals is the metal that reacts with dilute hydrochloric acid and its oxide is not reduced by heating with carbon.

35. (A)

The oxidation state of oxygen decreases from 0 to –2.

$C + O_2 \rightarrow CO_2$

Carbon reduces oxygen gas to form carbon dioxide.

Carbon monoxide reduces iron(III) oxide to iron metal.

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

The oxidation state of iron decreases from +3 to 0.

EXAM TIP:

Carbon and carbon monoxide act as reducing agents in the blast furnace.

36. (A)

Carbon monoxide is produced from incomplete combustion of fossil fuels. Complete combustion produces only carbon dioxide and water.

37. (B)

P and S belong to the homologous series of alcohols as both compounds have the –OH group.

EXAM TIP:

All the members of the same homologous series share the same functional group and can be described with a general formula.

38. (C)

Methane is a small alkane that is the main component of natural gas. Diesel, naphtha and petrol are mainly made of larger alkanes, and are found as liquids at room temperature.

EXAM TIP:

Relate the physical state of methane at r.t.p. to the boiling point of each fraction of petroleum.

39. (C)

Diesel oil consists of large hydrocarbon molecules. Ethene can only be obtained from diesel through cracking of these large molecules.

EXAM TIP:

Cracking involves the breakdown of large hydrocarbon molecules into smaller ones.

40. (B)

Ethanol is oxidised by atmospheric oxygen to form carboxylic acid and water.

EXAM TIP:

An alcohol is oxidised by atmospheric oxygen to form carboxylic acid and water.

October/November 2012 Paper 3

Section A

1.

gas	laboratory test	result of test
ammonia	insert damp red litmus paper	turns litmus paper blue
oxygen	**place a glowing splint**	bursts into flame
chlorine	insert damp litmus paper	**damp litmus paper is bleached**
sulfur dioxide	bubble into acidified potassium dichromate(VI)	**solution turns from orange to green**

EXAM TIP:

Describe the result of the test in terms of colour change.

2. **(a)** **(i)** 1. Iron liberates hydrogen gas when reacted with dilute hydrochloric acid.

2. Iron can be obtained from iron(III) oxide through heating with carbon.

(ii) Iron machinery can be coated with grease.